Influence of Women's Autonomy and Access to Health Services on Maternal Health Care Utilization in Rural India

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In traditional societies, a key factor believed to affect women's health-seeking behavior is their level of autonomy. In South Asia, social norms dictate that young married women defer to mothers-in-law, husbands and household elders in all matters, including those related to their own health and well-being. Efforts to improve women's health care utilization, as a result, are hindered by women's restricted abilities to seek care and act upon the information received from health programs.

There have been calls for improving women's autonomy with the expectation that it will lead to mortality declines and improve health outcomes for women and their children. A marked degree of female autonomy is probably central to exceptional mortality declines, especially in poor societies (Caldwell, 1986). The ways in which women's autonomy operates and leads to improvements in health is a question that has interested several researchers. In general, women's autonomy is associated with better health seeking behavior, which in turn, is expected to lead to improved health outcomes (Basu, 1992).

Research also shows that external factors supersede the abilities of families to improve health outcomes, thus, individual level improvement in health enhancing behavior may fail to translate into actual improvements in health outcomes unless community factors such as characteristics of health systems are taken into account (Desai, 1998).

Generally, the onus of health service utilization for maternal and child health care is placed on women's abilities to seek care with scant attention given to characteristics of health services. Efforts aimed at improving women's autonomy at the individual level may not be effective unless community-level resources including health systems are taken into account. Whether women's autonomy can lead to improvements in health care utilization under varying conditions of health service availability is a question that has been speculated upon but yet to be empirically examined.

Whether women's autonomy has an interactive relationship with health service availability in influencing health behavior or outcomes is a question that has implications for policy. If autonomy has a substitutive effect on health care availability, it would imply that women with high levels of autonomy are able to seek care, regardless of whether service availability is high or low. In such a situation, more investments will be needed for improving women's autonomy than for improving access to care, since autonomy will be able to compensate for deficiencies in service availability. On the other hand, if autonomy has a complementary effect on service availability; it would imply that both autonomy and service availability should be enhanced together to improve health care utilization rates among women.

The aim of the study was to examine the influence of enabling factors both at the individual and community level that affect maternal health care utilization when the effects of demographic characteristics are controlled. The interaction between two enabling factors, women's autonomy and health service access was examined to determine how health care utilization is affected under varying conditions of access and autonomy.

Women's Autonomy and Health Seeking Behavior

The literature on women's autonomy provides evidence for its associations with health seeking behavior for a range of outcomes including family planning use (Dyson and Moore, 1983; Morgan and Niraula, 1995), infant health care (Kishor, 2000) and maternal health care (Bloom et al, 2001). Some studies have determined the direct influence of women's autonomy on health outcomes such as infant survival (Das Gupta, 1990; Griffiths et al, 2001; Kishor, 2000).

The definition of women's autonomy has been extensively debated and the indicators used for measuring autonomy have consequently evolved (Malhotra et al, 2002). Prior studies on women's empowerment used women's education as an indicator of autonomy (Govindaswamy and Malhotra, 1996). Whereas, studies show that cultural differences affect the position of women and are not related to education (Basu, 1990). There have been calls for more direct measures of autonomy with the recognition that autonomy is multi-faceted and needs better indicators than were previously used (Jejeebhoy, 2000).

The study by Kishor (2000) in Egypt measured several dimensions of women's empowerment and found that different dimensions are associated with different sets of outcomes; empowerment, as embodied in women's familial environment, was more relevant to infant survival whereas, empowerment that enabled women's exposure to non-traditional ideas and behavior was more relevant to the child getting immunized.

The dimension of women's autonomy that influences their health seeking behavior has, similarly, been measured by direct sets of indicators. Freedom of movement and women's decision-making power have been utilized as measures of female autonomy related to maternal health care utilization in the Indian context (Bhatia and Cleland, 1995; Bloom et al 2001). Research in South Asia also shows the importance of taking account of contextual factors influencing autonomy when studying the effects of women's empowerment (Jejeebhoy, 2000; Koenig et al, 2003).

In summary, women's empowerment research has indicated the need for measuring autonomy as it relates to the specific outcome being studied. It also emphasizes the importance of taking account of the context, specifically by community-level enabling variables when the effects of autonomy are examined. A gap in the literature is an investigation of the interactive effects between autonomy and enabling factors in influencing health behavior.

Interactive Effects of Autonomy and Access to Health Care

The characteristics of health services, such as access to and quality of care have been studied to determine their associations with maternal health care utilization. Access to health facilities largely determined by distance to facilities significantly influences the probability of utilizing antenatal care and trained delivery care in India and Nepal (Acharya and Cleland, 2000; Griffiths and Stephenson, 2001; Hotchkiss, 2001).

A difficulty in examining the interplay between women's abilities to seek care and health service factors is that the two variables might covary. Since access to medical care is better in places where women's literacy is high, it is difficult to establish whether literate women would take better care of their children in the absence of medical facilities (Jain, 1985).

Dyson and Moore's (1983) thesis suggests that cultural factors including kinship patterns and property rights system in South India allows for greater autonomy among women, relative to the North Indian system, and this is reflected in better health care utilization rates among South Indian women. The findings are inconclusive with regard to the effect of access to health care in influencing women's abilities to seek care. The quality of care available through health systems in parts of South India are reported to be better than the North (Koenig et al, 2000) and this could lead to differentials in women's health care utilization; either through its independent effect or the interactive effect with women's autonomy.

The issue of differential autonomy affecting care utilization patterns while controlling for health service availability has been examined by Basu (1990). In the study women residing in the same locality and exposed to the same health services, reported different care utilization based on their cultural background. It is suggested that South Indian women had better health care utilization patterns compared to women from the North because of the higher degree of autonomy they enjoy. Among South Indian women, autonomy led to a higher level of interaction outside the home, and thereby increased knowledge about availability of health services and contact with health providers. While this study examined the effect of autonomy on health behavior, while controlling for health service availability, how autonomy performs under varying conditions of availability merits as a question of further interest.

While the interactive effect of autonomy has not been studied, the interaction between education and health service availability has been a topic of interest among researchers. The interaction between education and health service availability, referred to as a symbiosis between cultural and health inputs (Caldwell, 1986), is associated with improved health outcomes. Access to health services significantly modified the effect of women's education on child survival in Nicaragua, with the odds ratio for child mortality of illiterate mothers compared with the ones in an adult education group, increased steadily with traveling time to the nearest health facility (Sandiford et al, 1995). Similarly, Murthi et al (1995) find that medical facilities and female literacy have synergistic effects in reducing child mortality in India.

Data and Methods

Data for the study were obtained from the World Bank Survey of Living Conditions, 1997-98. The survey was conducted as a part of a study of rural poverty in the states of Uttar Pradesh and Bihar in India. Data were collected from a cross-sectional survey of 2,250 households in 120 villages of Uttar Pradesh and Bihar. The survey included

information on employment, housing, education, health, marriage and maternity history, food expenses, economic vulnerability, farming and income.

The household head was the respondent for the household roster and other parts of the survey, such as access to health facilities. Information on maternity history were collected from all women 15-45 years of age in the household who had ever been married and had given birth. Data on maternal health care utilization were collected from all household women 15 years or older who had delivered in the past three years. If the respondent had more than one birth in the past three years, she was asked to provide information on the most recent birth.

For the section on women's autonomy, interviewers were asked to conduct the interview with a group of household women together and elicit the views of younger as well as older (and typically more vocal) women and record the identification code of the woman who was the main respondent.

The community survey, conducted in 120 villages, collected data on village characteristics and infrastructure. The village data were collected from village informants. Interviewers were instructed to triangulate the information by collecting village data from more than one group of informants; the informants could include the *pradhan* or the village headman but the interviewers were instructed not to rely on the information obtained from the *pradhan* alone.

A sample of 1,207 women from the household survey was used for the analysis. The women in this sample reported having had a birth in the last three years and provided information on their maternal health care utilization behavior. Data on village characteristics derived from the community survey of 120 villages were linked with the household data on the sample women.

Variables

Dependent variables

Maternal health seeking behavior was indicated by women's use of antenatal care, health facility delivery and postnatal care. Dichotomous variables were constructed to measure each of the three dependent variables

Independent variables

Demographic variables

The independent variables included controls for demographic characteristics and reproductive history of women in the sample. Women's age was defined by a continuous variable. A categorical variable was created to measure a woman's education level, with illiterate women being the reference category. A continuous variable was created for measuring socioeconomic status.

Religion was included as a dichotomous variable, with Muslims as the reference category. Caste was also included as a dichotomous variable, with backward castes as the reference.

Household expenditure on durables such as clothing, medical care, toys etc. in the past year as reported by the head of the household was considered a measure for socioeconomic status. The rupee being a small amount, the household expenditure reported was divided by 10 to change the scale for the analysis.

Women's reproductive history was measured by prior experience of infant death and the number of living children she had. A history of prior infant death was included as a dichotomous independent variable. It was assumed that if women had experienced the death of an infant, she would feel a greater need for seeking care in subsequent pregnancies. A categorical variable was created to denote the number of living children a woman had, with women who did not have children or had only one child used as the reference category.

Enabling variables

The enabling factors were derived both from the household survey and the community survey. At the household level, reports of women's autonomy and access to health facilities were considered enabling variables. At the community level, the enabling variables included the presence of an *anganwadi* center (village health post for maternal and child health services), availability of electricity in the village and accessibility of the village by road.

A woman was considered autonomous based on reports of whether she would be able and willing to visit a doctor without male permission and without a male escort.[1] If a woman reported "yes" to either of these two items, she was allotted a score of 1, if she reported "no", a 0.

Distance to the closest primary health center, community health center and sub-center was included as a measure of access to health facility. A categorical variable was created to denote distance to facility, the categories included less than 0.5 kilometers, 0.5 to 3

[1] Information on women's autonomy was collected from a group interview conducted among household women and the main respondent was identified in the survey. These reports on autonomy have been considered as indicative of the household's reports of autonomy (as opposed to individual women's reports). It is likely that the women who constitute the study sample were present during the interviews and contributed to the group discussion but in some cases, they were not the ones who responded to the autonomy questions. In such cases, respondents to the autonomy question were mothers-in-law or sisters-in-law who resided in the household. It is expected that autonomy in health care seeking reported from other household women would pertain to all women in that household, therefore, these results are treated as predictors of health seeking behavior of the individual women in the study sample. The result of a chi-square test of whether autonomy reports varied by respondent was not significant.

kilometers, 4-10 kilometers, and more than 10 kilometers. The category for health facility more than 10 kilometers was used as the reference.

If the village had an *anganwadi* center that provided any of three maternal and child health services including growth monitoring, health checkups and maternity care, it was given a value of 1, and a 0 if it did not or if the center did not exist in the village.

Dichotomous variables were constructed to measure the availability of electricity in the village and whether the village was accessible by road. These variables were included as indicators of a community's level of development, which was expected to account for variability in the outcomes.

A dummy variable was created to test the interaction between access to health facilities and women's autonomy. If women reported being able to visit a health center without male permission or a male escort, they were considered high autonomy. Those who reported not being able to visit a health center without male permission or a male escort were considered low autonomy women. The access to health facility variable was dichotomized. Women were considered as having high access to a health facility, when the facility was located at a distance less than 3 kilometers. When facilities were located at more than 3 kilometers distance, they were considered low access.

A four-category variable was created for the interaction term; with the first category denoted observations that reported low levels of access to health facilities and low level of women's autonomy. The second category denoted those who reported high access to facilities and low autonomy. The third category included women who had high autonomy and low levels of access to health facilities. Women who had a high level of autonomy and a high level of access to health facilities comprised the fourth category. The first category for low access and low autonomy was the reference category.

Data Analyses

In the statistical analyses, the influence of the enabling variables on each of the outcome variables was determined, while controlling for the effect of the independent variables. Three separate analyses were carried out to examine the effect of women's autonomy, access to health services and the interaction between autonomy and access on the outcomes

The correlation between women's autonomy and women's education was examined; the two variables were not correlated. The data were checked for missing values. Some items had a small number of missing values (<2 percent). In such cases, the missing values were imputed. For the missing values on the distance to facility variable, distance reports were obtained from the community survey. In other instances, the hot deck method was used to impute missing values. Bivariate regression analyses were first carried out to test associations between variables and guide the multivariate analysis and tests for interactions between variables.

Multi-level logistic regression models were used to test the study hypotheses. Since the data were collected at two levels- the household and village level- they have a hierarchical structure. Therefore, standard regression models are not appropriate. Standard regression models depend on the assumption of independence among observations, whereas this assumption is violated in the case of hierarchical data. Since data have been collected from individuals nested within groups, the observations within groups are likely to share similarities and thus not be independent. Statistically, the intra-class correlation between observations within clusters leads to an underestimation of the standard error, which can lead to a greater likelihood of rejecting the null hypothesis and, thus committing a Type I error (Heck and Thomas, 2000). Multilevel modeling allows an analysis that provides statistically efficient estimates of regression coefficients and correct standard errors as well as an exploration of variation at different levels of the hierarchy (Goldstein, 1995).

The random effects model was used as it allows for variability within groups. The random effects model controls for factors influencing the outcome that have been omitted from the model, or factors that cannot be quantified in a large-scale social survey; it provides a mechanism for estimating the degrees of correlation in the outcome that exists at the household or community level (Stephenson and Tsui, 2003). The models were based on the formula:

$$\ln [pij / (1- pij)] = \beta 0 + \beta 1*X1ij + \ldots + \beta N*X\ Nij + \varepsilon\ j$$

where p is the probability of care seeking, β0 is the intercept. β1… βN denote the regression coefficients which represent the change in the log odds of the outcome variable associated with a unit change in each corresponding independent variable X1ij…. X Nij (while controlling for other independent variables) where j is the index for the groups at the community level and i is the index for individuals within the groups. ε j denotes the error term.

The formula for the multilevel logistic regression model with the interaction term included was:

$$\ln [pij / (1- pij)] = \beta 0 + \beta 1*X1ij + \beta 2*Z2ij + \beta 3\ Z\ jX\ ij + \varepsilon\ j$$

where Z jX ij denotes the product of variable Z with variable X.

The statistical software package STATA (Stata Corporation) version 8.0 was used for the analysis.

Results

Sample characteristics

The demographic profile of the sample (Table 1) shows that majority of women in the study were illiterate (76 percent) and approximately 12 percent each reported having a primary school education or a middle school education or above. The women had an

average number of 3.4 children. About 26 percent of women had experienced infant mortality.

The average yearly household expenditure on durables reported by the sample participants was Rupees 7,404. A majority of women in the study sample reported belonging to the Hindu religion (89 percent) and 11 percent were Muslims. Most participants belonged to backward castes (82 percent) and about 17 percent belonged to upper castes.

About two-thirds of women said they could not visit a health center without male permission (67 percent), whereas one-third of women (33 percent) felt they did not need male permission. Similarly, 68 percent women could not go to a health center without a male escort and 32 percent felt they did not need a male escort.

Most women in the sample did not receive antenatal care (67 percent) or postnatal care (85 percent). A majority of women delivered at home (87 percent) and only 13 percent delivered in a health facility.

The distribution of the community variables (Table 2) indicated that only 14 percent of women had a functioning *anganwadi* center that provided MCH services in their village. About half of the sample women resided in a village that was electrified and the majority (92 percent) lived in a village that was accessible by road.

Multivariate results

Autonomy models

The results from the multi-level logistic regression models show the associations of women's autonomy on the three outcomes, while controlling for demographic and community level factors (Table 4).

The results indicate that a higher level of autonomy in women significantly increased women's odds of receiving antenatal care (OR 1.80, 95% CI 1.35 – 2.41), delivering in a health facility (OR 1.61, 95% CI 1.06 - 2.44) and seeking postnatal care (OR 1.44, 95% CI 1.01 - 2.05).

All three outcomes were significantly associated with higher levels of education among women. As compared to women who were illiterate or uneducated, those who were literate or had primary school education had a higher odds of receiving antenatal care (OR 2.07, 95% CI 1.37 – 3.13), delivering in a health facility (OR 2.05, 95% CI 1.15 - 3.66) and seeking postnatal care (OR 2.17, 95% CI 1.34 – 3.54). The associations were stronger for women who had a higher level of education (Middle school or above).

Higher socioeconomic status of the household increased women's odds of utilizing care for all outcomes. Every percentile increase in the socioeconomic index, as approximated by household expenditure, was associated with an increased odds of a woman receiving

antenatal care (OR 1.16, 95% CI 1.10 – 1.23), delivering in a facility (OR 1.14, 95% CI 1.05 – 1.23) and receiving postnatal care (OR 1.09, 95% CI 1.02 - 1.16).

Upper caste women had a greater odds of receiving antenatal care (OR 1.69, 95% CI 1.13 - 2.53) and delivering in a health facility (OR 1.89, 95% CI 1.09 - 3.28) as compared to women who belonged to backward castes. Women who belonged to the Hindu religion had a higher odds of delivering in a facility relative to Muslim women (OR 2.43, 95% CI 0.98 – 6.04)

Women with five or more children had a lower odds of seeking postnatal care (OR 0.49, 95% CI 0.29 – 0.84) and experience of a prior infant loss increased women's odds of seeking postnatal care by 68 percent (OR 1.68, 95% CI 1.08 - 2.62)

The presence of an *anganwadi* center providing MCH services in the village increased women's odds of receiving antenatal care (OR 1.93, 95% CI 1.14 - 3.29), but was not associated with the other two outcomes.

The village development indicators, including availability of electricity and accessibility by road were not associated with any of the outcomes.

Access models

The results for the access models indicate significant associations between distance to facilities and maternal health care utilization (Table 5).

The odds ratio for women receiving antenatal care was 1.58 (95% CI 0.92 - 2.72) when the distance to a health facility was 4-10 kilometers, as compared to more than 10 kilometers, and 1.83 (95% CI 1.04 - 3.23) when the distance to facility decreased to 0.5-3 kilometers.

The odds of health facility delivery increased as access increased. Women who lived between 4-10 kilometers of a health facility had an odds ratio of 2.73 (95% CI 0.99 - 7.52) of delivering in a facility as compared to women who lived more than 10 kilometers of a health facility. The odds ratio increased to 3.91 (95% CI 1.38 - 11.06) when the distance to facility decreased to 0.5-3 kilometers. Women who lived within 0.5 kilometers of a facility had 7.07 (95% CI 2.11 - 23.70) times the odds of delivering in a health facility compared to women who lived more than 10 kilometers from a facility.

The odds of seeking postnatal care was also significantly associated with the access variable. As compared to women who lived more than 10 kilometers from a health facility, those who lived between 4-10 kilometers of a facility had 3.71 (95% CI 1.56 – 8.82) times the odds of seeking postnatal care. The odds of seeking postnatal care increased to 4.03 (95% CI 1.66 – 9.75) for women who lived within 0.5-3 kilometers of a facility, and to 5.25 (95% CI 1.82 - 15.21) for women who lived less then 0.5 kilometers of a facility.

Similar to the results of the autonomy models, other variables that retained positive associations with the outcomes included mother's education, socioeconomic index and caste. A similar inverse association was noted for the odds of seeking postnatal care if women had more than five children.

The results for the community level variables in the access models were similar to those obtained in the autonomy models.

Interaction models

The analysis for the interaction effect of health facility access and women's autonomy on the outcomes provided measures of the associations of the interaction variable with the three outcomes (Table 6).

The results show that when women's autonomy was low and access to facilities was high, no significant associations were observed for any of the outcomes.

When women's autonomy was high and access was low, the odds of seeking antenatal care was greater (OR 1.62, 95% CI 1.09- 2.40) relative to when both autonomy and access were low. A similar effect was observed for women seeking postnatal care (OR 1.57, 95% CI 0.95 - 2.60) but not for delivery care.

The odds of seeking care for all outcomes became significant and stronger when both autonomy and access were high. Antenatal care seeking for women who had both high access and high autonomy was associated with an odds of 2.22 (95% CI 1.42 - 3.45), health facility delivery had an odds of 2.85 (95% CI 1.50 - 5.40) and the odds for postnatal care was 1.86 (95% CI 1.09 - 3.16).

The patterns of associations for other variables in the model were similar to those observed in the previous models.

Discussion

Women's characteristics

Women's autonomy was significantly and positively related to all maternal health care utilization outcomes including antenatal care, health facility delivery and postnatal care. Women with high autonomy had a higher odds of seeking maternal health care, as compared to women with low autonomy, when the effects of demographic and community variables were controlled.

The indicator for women's autonomy in this study was a measure of women's freedom of mobility for seeking health care based on women's reports of whether they could visit a health center without male permission or a male escort. Freedom of movement has been found to be an important dimension of women's autonomy in this setting and its associations with maternal health care utilization suggests that even in traditional

societies where women have limited autonomy, certain freedoms such as those pertaining to women's mobility can have an important bearing upon their health behavior (Bloom et al, 2001).

Women's education showed strong significant associations with all outcomes. Both primary school education and middle school or higher education increased a woman's odds of seeking care during pregnancy, delivery and the postpartum period. Maternal education has been found to be an important determinant of health seeking behavior for pregnancy, delivery and/or child health services in other settings as well (Becker et al, 1993; Bhatia and Cleland, 1995; Celik and Hotchkiss, 2000; Terra de Souza, 2000; Obermeyer and Potter, 1991).

Some have suggested that mother's education may be a marker for other factors such as degree of social marginalization, access to health services and socioeconomic status (Terra de Souza, 2000). Others have suggested that for women in male-dominated societies, education provides a wider social network, new reference groups and a greater identification with the modern world (Cleland and van Ginneken, 1988).

The findings of this study lend support to the idea that both autonomy and education positively influence women's health seeking behavior. Based on their finding that the impact of women's education on the use of maternal health care was roughly equal to that of their autonomy levels, Bloom et al (2001) suggest that policies have to go beyond merely enhancing women's educational opportunities.

The results of this study too provide evidence that education and autonomy influence health behavior, independent of one another. This provides a rationale for developing strategies for increasing women's autonomy and education simultaneously as such efforts will not only improve their overall levels of development, but also their chances for better health and survival by increasing their likelihood of receiving care related to pregnancy and childbirth.

Access to health services

Access to health facilities showed associations in the expected direction with the study outcomes. Closer distance to health facility was positively associated with the odds of seeking antenatal care, postnatal care and delivering in a health facility. Prior studies that have examined the association between distance to facility and use of pregnancy and delivery care have provided inconsistent findings. Paul and Rumsey (2002) did not find use of delivery care to be associated with distance to facility in Bangladesh, while others such as Voorhoeve et al (1984) found distance and public transport to be the most important obstacles to women in getting delivery care in Kenya.

Improved physical access to health care services had a strong impact on the use of prenatal care and delivery assistance by a trained health provider in Nepal (Hotchkiss, 2001) and Guatemala (Pebley et al, 1996). Becker et al (1993) found travel time to a health facility to be significantly associated with use of maternal and child health services

in rural, but not urban areas in the Philippines. Acharya and Cleland (2000) found a modest effect of access relative to the strong effect of quality of services on utilization of maternal and child healthcare in Nepal. In this study, a clear association between access to health facilities and maternal health care utilization emerged. As distance to facilities decreased, a corresponding increase was seen in women's odds of delivering in a facility instead of home, and seeking postnatal care. Although significant, a similar association of increasing odds associated with decrease in distance was not observed for antenatal care perhaps because antenatal services are available through outreach programs in the community and women do not have to travel to a facility to receive care.

This finding indicates that improving access to facilities can have a positive effect on enhancing women's health care utilization. The finding also indicates women's willingness to dispense with traditional customs when modern health services are easily accessible. The traditional practice of delivering at home was less likely to be the choice when health facilities were within easy reach. Maternal health programs tend to be based on the assumption that rural women prefer not to deliver in health facilities because of adherence to traditional customs and beliefs. Policies and programs thus have focused on training birth attendants and providing delivery kits that reinforce the practice of delivering at home. While such efforts address the immediate need for delivery care in rural areas, they neglect the importance of improving access to health services as an incentive for women to choose modern medical care over traditional care and making available care needed in life-threatening situations.

Autonomy/Access interaction

The findings for the interaction between access to health facilities and women's autonomy indicate synergy between enabling factors in their effect on the care-seeking process. When both health facility access and women's autonomy were high, women sought care for all three outcomes. In contrast, for low autonomy, high access to facilities did not show associations with any of the outcomes. High autonomy in the absence of high access had significant associations with antenatal care and postnatal care.

In this study, a complementary effect of the interaction between women's autonomy and access to health services was noted. Previous studies examining interactions between individual attributes and community characteristics have shown inconsistent findings. The interaction between maternal education and community characteristics has been most commonly studied. While some studies have found substitutive effects (Rosenzweig and Schultz, 1982; Sandiford et al, 1995; Thomas et al, 1990), others have demonstrated complementariness of effects between variables (Murthi et al, 1995). Some have suggested that relationships between variables may be complementary in some situations and substitutive in others, depending on various factors including the geographical setting and the measures and statistical techniques employed (Sastry, 1996).

These findings indicate that women's characteristics interact with health service access in influencing health-seeking behavior. Typically, programs aim either to create demand for health care by improving women's abilities to seek care or improving availability and

quality of health care. In either case, only one side of the care-seeking process is addressed. These results imply that both women's capacity to seek care and characteristics of health systems have to be improved simultaneously to improve health care utilization.

More specifically, enhancing women's autonomy and community health resources have to go hand-in-hand in order to bring about improvements in maternal health seeking behavior. According to Jejeebhoy (2000), strategies to enhance women's autonomy have to expand beyond education, employment to more comprehensive, direct and context-specific strategies that enable women to mobilize community resources and public services.

Demographic factors

Some demographic variables showed significant associations with the outcome behaviors independent of women's autonomy and access to health facilities. The results for the demographic indicators indicate that marginalized groups in Indian society face disadvantages in accessing health services.

Health facility delivery was significantly related to religion, indicating that Muslim women are at greater odds of delivering at home as compared to Hindu women. Caste was also strongly associated with all outcomes. Upper caste women were at higher odds of receiving care compared to lower caste women, indicating one of the several disadvantages associated with belonging to lower castes. Caste has been found to have a strong influence on the use of maternal and child health services in rural India (Taylor et al, 1983).

All outcome behaviors were influenced by women's socioeconomic status. The strong significant positive associations of the outcomes with the socioeconomic index indicate the disadvantage faced by women belonging to poorer socioeconomic groups relative to those who were in the higher socio-economic strata. These results are in conformity with evidence from other settings that show socioeconomic status to be a significant determinant of maternal health care utilization (Becker et al, 1993; Celik and Hotchkiss, 2000; Obermeyer and Potter, 1991; Shakya and McMurray, 2001).

The findings indicate that the overall disadvantage faced by certain demographic groups extends to a disadvantage in seeking health care. Women belonging to vulnerable groups, such as lower castes, lower socioeconomic strata and religious minorities have a lower odds of receiving care during pregnancy, delivery and postpartum. Policies and programs are needed to address inequalities in health coverage and improve health care utilization among marginalized women. Interventions can be directed to meet the specific needs of these demographic groups and address social, cultural and financial constraints that prevent them for seeking care.

Women's age showed expected inverse associations with delivering in a health facility, indicating that younger women were more inclined to seek care relative to older women.

Bhatia and Cleland (1995) found a weak association between age and place of delivery in South India but the association of pregnancy order was strong, indicating that primigravidae have a higher odds of delivering in a health facility, relative to women having a second to fourth pregnancy.

Variables pertaining to women's prior reproductive outcomes including number of children and history of infant mortality were associated with some of the outcome variables. Women with fewer children had a higher odds of delivering in a health facility. Similarly, women with five or more children had a lower odds of receiving antenatal care and postnatal care. These findings correspond to prior evidence indicating that women with high fertility are less likely to receive pregnancy and delivery care compared to women with smaller families (Celik and Hotchkiss, 2000; Obermeyer and Potter, 1991; Stephenson and Tsui, 2002).

It has been suggested that high parity women do not feel the need to seek pregnancy and delivery care because of their maternity experiences, difficulties in arranging for childcare, and affording care, as they are likely to belong to a lower socioeconomic status (Stephenson and Tsui, 2002). Providing women with family planning information and services will allow them the means of controlling their fertility, which in turn can increase their likelihood of seeking maternal and child health care. Parity should be used as a criterion for targeting educational campaigns on the benefits of safe motherhood programs (Celik and Hotchkiss, 2000).

The association of postnatal care with a history of infant mortality suggests that women visit a health center or a provider for a check up after delivery if they had had a prior infant loss. Another study in Uttar Pradesh found that previous experience of a child's death increased the women's odds of receiving antenatal care and using medical childbirth facilities (Stephenson and Tsui, 2002). This finding suggests that women perceive a greater need for seeking care after having experienced adverse outcomes. A history of prior obstetric problems was found to be significantly related to the probability of delivering in a health facility in South India (Bhatia and Cleland, 1995). Health education programs are needed for emphasizing the universality of risks associated with pregnancy and childbirth and discourage women from relying on the experience of complications or adverse outcomes to provide the impetus for seeking care.

Community factors

The inclusion of community level variables in the analyses provided controls for a village's level of development. One community-level variable that measured the availability of MCH services at the village *anganwadi* center was significantly associated with women's use of antenatal care services but not delivery and postnatal care. The *anganwadi* center typically provides very basic maternal and child health services, which tend to be limited to antenatal care checkups. The finding indicates the utility of *anganwadi* centers, however basic their level of operation, in providing checkups to pregnant women who otherwise might not receive them. The effectiveness of the

anganwadi in this respect provides a rationale for expanding the range of health information and primary care available at the center for maternal and child health.

Although not the best measures of community development, the electricity and road variables were not associated with the outcomes. Overall, this and other study findings suggest that focused interventions such as those that increase women's autonomy and health service access are more valuable for improving maternal health care utilization in low-resource settings. Interventions for addressing specific predictors of maternal health behavior are recommended in the interim while waiting for community development efforts and their health benefits to take effect in the longer-term.

Table 1. Demographic Characteristics of Sample

	N	%
Age		
15-20	145	12.01
21-25	381	31.57
26-30	378	31.32
31-35	188	15.58
36-40	82	6.79
>=41	33	2.73
Education		
Illiterate	921	76.30
Literate/Primary school	142	11.76
Middle school or above	144	11.93
Number of children		
1-2	473	39.19
3-4	388	32.15
>=5	346	28.67
History of infant mortality		
No	893	73.99
Yes	314	26.01
Annual household expenditure		
<=Rupees 5,000	722	59.82
Rupees 5,001-10,000	245	20.30
>=Rupees 10,001	240	19.88
Religion		
Hindu	1072	88.82
Muslim	135	11.18
Caste		
Backward	994	82.35
Higher	213	17.65
Total	1,207	100

Table 2. Individual and Community-level Enabling Characteristics in Sample

	N	%
Individual level		
Women's autonomy		
Visit health center without male permission		
No	809	67.42
Yes	391	32.58
Visit health center without male escort		
No	818	68.17
Yes	382	31.83
Access to health services		
Distance to health center		
<0.5 Km	75	6.21
0.5-3 Km	445	36.87
4-10 Km	528	43.74
>10 Km	159	13.17
Community level		
Village *anganwadi* provides MCH services		
No	1035	85.75
Yes	172	14.25
Electricity available in the village		
No	581	48.14
Yes	626	51.86
Village accessible by road		
No	101	8.37
Yes	1106	91.63
Total	1,207	100

Table 3. Use of Antenatal Care, Health Facility Delivery and Postnatal Care in Sample

	N	%
Antenatal care		
No	810	67.11
Yes	397	32.89
Health facility delivery		
No	1,055	87.41
Yes	152	12.59
Postnatal care		
No	1,025	84.92
Yes	182	15.08
Total	1,207	100

Table 4. Odds Ratios and 95% Confidence Intervals for the Effect of Women's Autonomy on Outcomes

		Antenatal Care	Delivery Care	Postnatal Care
Age		0.98	0.95**	1.00
		(0.95 - 1.01)	(0.90 - 0.99)	(0.96 - 1.04)
Education	Illiterate	1.00	1.00	1.00
	Literate/Primary school	2.07***	2.05**	2.17***
		(1.37 – 3.13)	(1.15 - 3.66)	(1.34 – 3.54)
	Middle school and above	2.69***	2.95***	2.18***
		(1.68 – 4.31)	(1.65 - 5.29)	(1.28 – 3.69)
Number of children	2-4	1.00	1.00	1.00
	0-1	0.74	1.67	1.29
		(0.50 – 1.10)	(0.99 - 2.80)	(0.82 - 2.03)
	5+	0.72	0.86	0.49***
		(0.48 – 1.07)	(0.45 - 1.62)	(0.29 – 0.84)
History of infant mortality	No	1.00	1.00	1.00
	Yes	1.10	1.41	1.68**
		(0.77 – 1.56)	(0.82 - 2.41)	(1.08 - 2.62)
Socioeconomic index		1.16***	1.14***	1.09**
		(1.10 – 1.23)	(1.05 – 1.23)	(1.02 - 1.16)
Religion	Muslim	1.00	1.00	1.00
	Hindu	0.92	2.43*	1.10
		(0.56 – 1.52)	(0.98 – 6.04)	(0.59 - 2.04)
Caste	Backward	1.00	1.00	1.00
	Upper	1.69**	1.89**	1.49
		(1.13 - 2.53)	(1.09 - 3.28)	(0.94 - 2.36)
Autonomy	Low	1.00	1.00	1.00
	High	1.80***	1.61**	1.44**
		(1.35 – 2.41)	(1.06 - 2.44)	(1.01 - 2.05)
Village *anganwadi* provides MCH services	No	1.00	1.00	1.00
	Yes	1.93**	1.01	1.22
		(1.14 - 3.29)	(0.45 - 2.28)	(0.68 - 2.19)

Electricity available in village	No	1.00	1.00	1.00
	Yes	1.15	1.25	1.30
		(0.77 - 1.71)	(0.68 - 2.28)	(0.83 - 2.06)
Village accessible by road	No	1.00	1.00	1.00
	Yes	1.47	1.43	1.87
		(0.75 - 2.88)	(0.50 - 4.08)	(0.78 – 4.47)
Observations		1207	1207	1207

*p<.10, **p<.05, *** p<.01

Table 5. Odds Ratios and 95% Confidence Intervals for the Effect of Access to Health Facility on Outcomes

		Antenatal Care	Delivery Care	Postnatal Care
Age		0.98	0.95**	1.00
		(0.95 - 1.01)	(0.91 - 1.00)	(0.97 - 1.04)
Education	Illiterate	1.00	1.00	1.00
	Literate/Primary school	2.19***	2.10**	2.26***
		(1.44 – 3.32)	(1.17 - 3.75)	(1.38 - 3.68)
	Middle school and above	2.72***	2.82***	2.08***
		(1.70 – 4.36)	(1.57 – 5.09)	(1.23 - 3.53)
Number of children	2-4	1.00	1.00	1.00
	0-1	0.77	1.70**	1.34
		(0.52 - 1.13)	(1.01 - 2.84)	(0.85 - 2.09)
	5+	0.70*	0.85	0.48***
		(0.47 - 1.05)	(0.45 - 1.61)	(0.28 – 0.81)
History of infant mortality	No	1.00	1.00	1.00
	Yes	1.16	1.43	1.78**
		(0.81 - 1.65)	(0.83 - 2.45)	(1.15 - 2.77)
Socioeconomic index		1.17***	1.13***	1.09**
		(1.11 - 1.23)	(1.04 – 1.22)	(1.02 - 1.16)
Religion	Muslim	1.00	1.00	1.00
	Hindu	0.90	2.02	1.01
		(0.54 - 1.48)	(0.83 – 4.90)	(0.55 - 1.87)
Caste	Backward	1.00	1.00	1.00
	Upper	1.64**	1.80**	1.45
		(1.09 - 2.45)	(1.04 – 3.12)	(0.92 - 2.29)
Distance to health facility	10+ kilometer	1.00	1.00	1.00
	4-10 kilometer	1.58*	2.73*	3.71***
		(0.92 - 2.72)	(0.99 - 7.52)	(1.56 – 8.82)
	0.5-3 kilometer	1.83**	3.91**	4.03***
		(1.04 - 3.23)	(1.38 - 11.06)	(1.66 – 9.75)
	<0.5 kilometer	1.45	7.07**	5.25***
		(0.65 - 3.28)	(2.11 - 23.70)	(1.82 - 15.21)

Village *anganwadi* provides MCH services	No	1.00	1.00	1.00
	Yes	1.96**	0.93	1.18
		(1.14 - 3.36)	(0.42 - 2.04)	(0.67 – 2.06)
Electricity available in village	No	1.00	1.00	1.00
	Yes	1.11	0.98	1.20
		(0.74 - 1.67)	(0.55 - 1.74)	(0.77 – 1.86)
Village accessible by road	No	1.00	1.00	1.00
	Yes	1.35	1.22	1.43
		(0.67 - 2.75)	(0.42 - 3.60)	(0.59 - 3.46)
Observations		1207	1207	1207

*p<.10, **p<.05, *** p<.01

Table 6. Odds Ratios and 95% Confidence Intervals for the Interaction of Autonomy and Access on Outcomes

		Antenatal Care	Delivery Care	Postnatal care
Age		0.98	0.95**	1.00
		(0.95 - 1.01)	(0.90 - 0.99)	(0.96 - 1.04)
Education	Illiterate	1.00	1.00	1.00
	Literate/Primary school	2.05***	2.01**	2.17***
		(1.35 - 3.11)	(1.12 - 3.60)	(1.33 - 3.53)
	Middle school and above	2.68***	2.89***	2.13***
		(1.67 - 4.29)	(1.60 - 5.19)	(1.26 - 3.61)
Number of children	2-4	1.00	1.00	1.00
	0-1	0.75	1.68*	1.29
		(0.51 - 1.10)	(1.00 - 2.83)	(0.83 - 2.03)
	5+	0.71*	0.86	0.49***
		(0.47 - 1.07)	(0.45 - 1.62)	(0.29 - 0.84)
History of infant mortality	No	1.00	1.00	1.00
	Yes	1.12	1.47	1.70**
		(0.79 - 1.59)	(0.85 - 2.54)	(1.09 - 2.65)
Socioeconomic index		1.16***	1.13***	1.08**
		(1.10 - 1.23)	(1.04 - 1.23)	(1.01 - 1.16)
Religion	Muslim	1.00	1.00	1.00
	Hindu	0.92	2.32*	1.07
		(0.56 - 1.51)	(0.94 - 5.74)	(0.58 - 1.99)
Caste	Backward	1.00	1.00	1.00
	Upper	1.69**	1.90**	1.50*
		(1.13 - 2.53)	(1.10 - 3.30)	(0.95 - 2.37)
Autonomy/Access Interaction	Low autonomy/Low access	1.00	1.00	1.00
	Low autonomy/High access	1.09	1.70	1.42
		(0.72 - 1.65)	(0.92 - 3.14)	(0.86 - 2.34)
	High autonomy/Low access	1.62**	1.43	1.57*
		(1.09 - 2.40)	(0.77 - 2.64)	(0.95 - 2.60)
	High autonomy/High access	2.22***	2.85***	1.86**
		(1.42 - 3.45)	(1.50 - 5.40)	(1.09 - 3.16)

Village *anganwadi* provides MCH services	No	1.00	1.00	1.00
	Yes	1.90**	0.97	1.20
		(1.12 - 3.23)	(0.43 - 2.17)	(0.68 - 2.15)
Electricity available in village	No	1.00	1.00	1.00
	Yes	1.13	1.19	1.28
		(0.76 - 1.69)	(0.65 - 2.17)	(0.81 - 2.00)
Village accessible by road	No	1.00	1.00	1.00
	Yes	1.45	1.34	1.74
		(0.73 - 2.85)	(0.46 – 3.83)	(0.73 - 4.16)
Observations		1207	1207	1207

*p<.10, **p<.05, *** p<.01

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